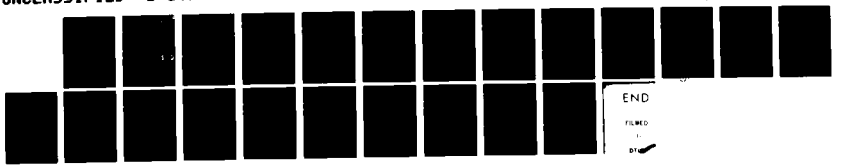
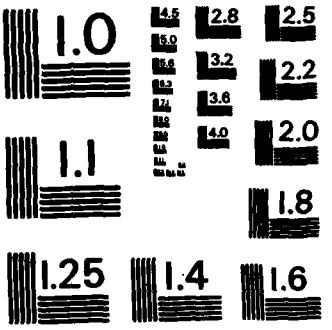
AD-A120 940 STRESSOR EFFECTS IN LAB AND LIFE: CORRESPONDENCES 1/1
BETWEEN THE EFFECTS OF T.. (U) MILTON S HERSHEY MEDICAL
CENTER HERSHEY PA DEPT OF BEHAVIORAL..
UNCLASSIFIED S STREUFERT ET AL. SEP 82 ONR-TR-9 F/G 6/19 NL





unclassified

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE

READ INSTRUCTIONS BEFORE COMPLETING FORM

1. REPORT NUMBER: Technical Report ONR No.9

2. GOVT ACCESSION NO.: AD-A120940

3. RECIPIENT'S CATALOG NUMBER:

4. TITLE (and Subtitle): Stressor Effects in Lab and Life: Correspondences between the effects of the accident at Three-Mile Island and Stress Responses in the Laboratory.

5. TYPE OF REPORT & PERIOD COVERED:

6. PERFORMING ORG. REPORT NUMBER:

7. AUTHOR(s): Siegfried Streufert, Ph.D., Susan C. Streufert, Ph.D., Ann L. Denson, M.S. and Peter Houts, Ph.D.

8. CONTRACT OR GRANT NUMBER(s): N00014-80-C-0581

9. PERFORMING ORGANIZATION NAME AND ADDRESS: PA State University, College of Medicine, Dept. of Behavioral Science, M.S. Hershey Med. Ctr. Hershey PA 17033

10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS: NR 170-909

11. CONTROLLING OFFICE NAME AND ADDRESS: Office of Naval Research Code 442, Quincy Street, Arlington, VA 22217

12. REPORT DATE: September 1982

13. NUMBER OF PAGES: 21

14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office):

15. SECURITY CLASS. (of this report): unclassified

15a. DECLASSIFICATION/DOWNGRADING SCHEDULE:

16. DISTRIBUTION STATEMENT (of this Report): Approved for public release; distribution is unlimited

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report):

DTIC ELECTE NOV 0 1 1982 S D E

18. SUPPLEMENTARY NOTES:

19. KEY WORDS (Continue on reverse side if necessary and identify by block number): accidents, attitudes, arousal, blood pressure, computers, heart rate, information, laboratory research, life stress, load, performance, stress, Three Mile Island visual motor tasks

20. ABSTRACT (Continue on reverse side if necessary and identify by block number):

Persons with diverse responses to the Three Mile Island nuclear accident (residents of the ten mile area around the power plant) were placed in a laboratory stress environment to compare stress responses in lab and life. Considerable correspondences between persons' responses to TMI (attitudes and excess visits to medical services) and their elevations of (especially diastolic) blood pressure in the lab were obtained. The data are considered evidence for external validity of lab stressor procedures

DD FORM 1 JAN 73 1473 EDITION OF 1 NOV 65 IS OBSOLETE S/N 0102-LF-014-6601

unclassified

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

STRESSOR EFFECTS IN LAB AND LIFE:

CORRESPONDENCES BETWEEN THE EFFECTS OF THE ACCIDENT AT THREE MILE ISLAND AND STRESS RESPONSES IN THE LABORATORY

Siegfried Streufert, Susan C. Streufert, Ann L. Denson

and Peter Houts

Pennsylvania State University

College of Medicine

Hershey, PA 17033

Two decades ago, researchers were still reminding each other that research quality was in part a function of the internal validity of experimentation. External validity was considered superflouous, if not frivolous (c.f. Arsonson and Carlsmith, 1968). With the last decade, the emphasis has shifted toward the inclusion of external validity as a criterion for quality (c.f. Fromkin and Streufert, 1976). More recently, external validity is often considered a sine qua non for research efforts in a number of applied areas (Streufert and Suedfeld, 1982; Wortman, 1980) and is viewed as a minimum requirement for applicable research efforts (Nogami, 1982).

Recognizing the importance of external validity, however, does not necessarily require that all research must be carried out in applied settings. Often, the necessary control, which assures that reliable data without confounds are obtained, cannot be achieved in the field. In other words, laboratory

research continues as a necessity. The results of that research should, however, be validated against measures that are obtained from relevant behavior in the "real world." At times, such validation is possible only after work in the laboratory has been completed. At other times and in other projects, validation efforts can occur midway through laboratory data collection, allowing for potential course corrections in the research design.

The present research project is concerned with stressor effects on a number of measures of task performance and satisfaction. Such research must necessarily be concerned with the question whether intended stressors are indeed present in the independent variable manipulations. Further, one must be concerned whether stressors (1) occur at sufficiently high levels, (2) are of an equivalent or comparable nature to those occurring naturally in real world settings, and (3) have effects which are sufficiently stable over time (since research has shown that the experience of simulated stress may diminish where real world stress shows lesser or no adaptation, c.f. Krahenbuhl, 1980). Insufficient stressor levels or inappropriate stressors would likely result in a mismatch between observed stressor effects in lab and life and would certainly reduce the value of laboratory data. The efforts reported in this technical report are concerned with an evaluation of stressor effects in the laboratory as compared with the effects of naturally occurring stressor events.

Stressor effects in the present research have been induced through information load manipulation in a visual motor task (a non-social environment) and via three different social settings. The first setting represents a rest period in the presence of (but lacking interaction with) another person.

The second social condition is a complexity interview, carried out in a pleasant manner, but allowing the subject to respond to a series of questions which evoke previous problems (e.g., conflicts) which the person has experienced. The third social setting is an unpleasant interview developed to measure subjects' Type A Coronary Prone Behavior tendencies. Previous research with this series of stressor conditions (e.g., Streufert, Streufert, Lewis, Henderson and Shields, 1982) has utilized systolic blood pressure, diastolic blood pressure and heart rate elevations (delta values) over non-social baseline as an indicator of stressor experience. The authors found that one can clearly distinguish between two stressor types: (1) socially induced stressors resulting in parallel elevations of all physiological measures, and (2) task related stressors, resulting in diastolic elevation in the presence of decreased systolic elevation. It is assumed that social stressors generate a more central cardiovascular response while the non-social stressors result in peripheral constriction, possibly due to increased secretion of norepinephrine.

Previous research has shown that persons exposed to serious naturally occurring stressor events can be separated into two, often near-equal size groups: those who respond to stressor events with psychologically perceived stress and with physiological strain (e.g., elevated blood pressure, increased heart rate and epinephrine/norepinephrine secretion) and those who show few, if any, psychological or physiological responses. Can similar differences between these groups be expected in the laboratory? If stressors from the real world are similar to laboratory induced stressors, then persons who have shown stress or strain responses during times of natural stressor events should demonstrate elevated physiological responses to laboratory stressors as well. On the other hand, persons who have shown little response

to naturally occurring stressor events should produce lesser physiological or behavioral responses in the laboratory.

Subjects drawn for the present research project are adult working males living in the vicinity of Hershey, PA, i.e., within a five mile or ten mile radius of Three Mile Island. The accident at the TMI nuclear power plant in the spring of 1979 and the events of the following two weeks were potentially very stressful. A number of researchers have reported psychological effects of the TMI events in area residents ranging from fear, threat perception, medical and/or psychiatric symptom reporting and negative emotional tone to decrements in task performance (e.g., Davidson, Baum and Collins, in press; Dohrenwend, Dohrenwend, Kasl and Warheit, 1979; Flynn, 1979; Houts, Miller, Ham and Tokuhata, 1980). While stress effects of the accident have decreased over time, they remain elevated above levels obtained at considerable distance from the stricken power plant (e.g., Baum, Gatchel and Schaeffer, 1982; Bromet, 1980; Collins, Baum and Singer, 1982; Fleming, Baum, Gisriel and Gatchel, 1982). It is quite possible that responses to stressors can become stylistically stable, resulting in elevated responsivity in general and in higher levels of response to later stressors (of similar or different nature) in specific.

Research data obtained by Houts and associates (e.g., Henderson, Houts and Miller, 1982; Houts and Goldhaber, 1981; Houts et al, 1980) on stress experiences during and following the TMI accident are available for thirty-two of the subjects who have participated in the present research project. It would appear useful to compare the responses of these persons to the TMI accident with their responses to laboratory stressors. If persons who reacted with considerable stress and/or strain at the time of TMI respond

with elevated physiological responsivity and with psychological stress to the laboratory setting, then commonality of stressor effects from life to lab may be assumed.

Measures obtained by Houts and associates include three which are of some value to the present comparison of lab and life: (1) a measure of how upset the subjects were (five point attitude scale) during the accident, a set of data obtained approximately one month after the TMI disaster, (2) a measure of the number of times these persons tended to generally visit a physician (possibly reflecting an attempt to obtain control of one's fate, a possible means of reducing stressor impact) and (3) a measure of the excess number of visits (beyond the usual rate) to a physician during the year following the TMI disaster. Excess utilization of medical services has been suggested as an indication of stress. The latter two measures represent simple counts of visits to the clinic of the Department of Family and Community Medicine at the Hershey Medical Center.

It is without question that the events of TMI and the associated measures (response to an attitude scale, number of visits to a physician) are quite different from the physiological measures in the laboratory (delta blood pressure and heart rate) and in addition, these two measurement periods are quite remote from each other in time. Consequently, a strong association cannot be expected. However, if some relationship is nonetheless obtained, it would lend particular strength to an assumption of similarities between stressors in life and those utilized in the present laboratory methodology.

METHOD

Collection of Laboratory Data

1. Stressor Conditions

Five different stressor conditions were employed. They were selected to differ in the degree of potential stress, in the social vs. non-social

environment in which they occurred, and in the kind of behavior/performance that was required. All conditions were selected to allow precise control of experimental variables, while maintaining similarity to work environments with which they might be compared. The following conditions were utilized:

Non-social baseline: resting alone, probably not unlike the break taken in a private setting. The following four conditions were compared to this condition; differences are expressed as delta values which are used as the basis for data analysis (see below).

Social baseline: resting in the presence of another person, probably not unlike the break taken with others present, but without interaction with them.

Complexity interview: a task in which a social interchange on non-self selected topics occurs, in a pleasant, open interpersonal atmosphere. The complexity interview is based on the Sentence Completion Task on which extensive validity and reliability data, as well as administrative requirements, are available.

Type A interview: a task in which social interchange on non-self selected topics occurs, in an unpleasant, challenging interpersonal atmosphere, not unlike the interaction with a somewhat hostile demanding boss. Again, extensive reliability and validity data as well as administration requirements are available.

Video game task: a non-social, task-oriented setting in which the person is working alone against different levels of experimentally scaled and controlled challenges, experiencing both potential success and failure in the task setting. The task is similar to many hand-eye coordination tasks found in work environments.

The following section will discuss how these tasks were employed in the research.

Procedure

Thirty-two working adult male paid volunteers** participated as individuals in a series of tasks. Total time spent in the experimental setting was approximately four hours per person. Upon arrival at the laboratory, each subject was individually briefed about the forthcoming events. His signature on a consent form was obtained. Subjects were then taken to one of two identical experimental rooms. For one-half of the subjects the experimental procedure began when the experimenter attached a blood pressure cuff to the dominant arm. The cuff allowed the experimenter to measure systolic blood pressure, diastolic blood pressure and heart rate at two-minute intervals.* The experimenter then sat at a desk across from the subject and asked a number of biographic questions. Responses to the questions were recorded by the experimenter on a data sheet. Upon completion of the biographic questionnaire, the subject was asked to sit back and relax for a few minutes. The experimenter remained in the room and quietly worked on organizing a set of papers.

---

*Measurements were taken automatically by a Vitastat 900D and recorded on tape. Alarms were sounded when blood pressure would exceed 200 mm Hg systolic. Two successive readings at this level were considered dangerous and would have resulted in excluding the subject from further participation in the research. No such readings were, however, obtained.

**While more than thirty-two subjects participated in the research, the number of subjects available for this analysis was restricted to 32, since (1) subjects had to have participated in the survey of Houts et al and had to be (or have been) patients at HMC (see below) and (2) an equal number of high and low scoring subjects was selected (see below) to overcome considerable variance difference effects in the analyses.

Complexity Interview

After approximately six minutes, the experimenter handed the subject a set of cards. Each card contained the stem of a sentence (e.g., When someone competes with me . . .). The subject was asked to complete the sentence orally and add several additional sentences on the same topic. After the subject completed his responses to the card, the experimenter asked several non-leading, non-directive questions, encouraging the subject to continue his statements on the topic at hand. When the subject's repertoire of responses to each topic was exhausted, he was asked to go on to the following card. A total of 12 cards was presented. The procedure represents an interview version of the Sentence Completion Test (Schroder and Streufert, 1963; Schroder, Driver and Streufert, 1967) designed to measure cognitive complexity. The behavior and responses to the experimenter allowed the subjects to "open up" and present their significant thoughts and feelings to another person. Responses of the subjects were recorded on videotape for future analysis. Physiological measurement procedures during this and other parts of the research will be discussed below in the section on measurement.

Type A Interview

Following the complexity interview, the original experimenter left the room and a second experimenter entered and administered the Type A Structured Interview developed by Rosenman and Friedman (c.f., Rosenman, 1978) to measure coronary prone behavior. The interview represents a standardized social challenge situation considered by many to exemplify severe social stress. The responses of subjects were again videotaped. After completion

of the interview, the blood pressure cuff was removed from the subject's arm to allow him the freedom to write. The subject was then asked to respond to a paper-and-pencil questionnaire (of no interest to this paper).

Collection of Non-social Baseline Data

Upon completion of the questionnaire, the subject was escorted to another (identical) experimental room. The blood pressure/heart rate cuff was attached to the non-dominant arm and the subject was instructed to watch a video screen. After the experimenter left the room, videotaped instructions for a video game (similar to Pac Man) were presented on the screen. Instructions were detailed enough to allow all subjects, including those who had no previous experience with video games to understand the task. The task itself was selected for its general interest across divergent groups of potential subjects and because it did not rely on considerable previous experience with video games. Once the subject had completed watching the instructions, he was asked to sit back and relax for a few minutes while a kaleidoscopic display of colors slowly unfolded on the video screen in front of him. Subjects spent several minutes watching the kaleidoscope.

Hand-eye Coordination Task

The video game began with a practice period at a slow speed and low difficulty level, allowing even the uninitiated to perform quite well. Following the practice period, subjects rated the difficulty level of the task, the difficulty level others might experience, their satisfaction with their own performance and their enjoyment of the task on seven-point scales.

They then sat back (as instructed) to once more relax for a few minutes. Ratings and relaxation periods were introduced following each of the five game periods. The four game periods following the practice period were systematically varied in difficulty level (in random order) from relatively easy (little or no stress) to very difficult (moderately high stress). Perceptions of difficulty matched the experimentally induced difficulty levels. Even those unfamiliar with video games found the easy task level to be very easy and even those who reported considerable experience with video games found the most difficult task level to be very difficult. None of the subjects reached the supposed "average score obtained by most players" at the most difficult task level. At the completion of the video game hand-eye coordination task, subjects were again asked to sit back and relax for a few minutes. Finally, the experimenter reentered the room, removed the blood-pressure/heart-rate cuff and instructed the subject to complete another paper-and-pencil questionnaire. Following the completion of that questionnaire, subjects were debriefed, paid and released.

The task sequence described above held for one-half of the subjects. The remaining subjects were exposed to the experimental procedure in the inverse order (paper-and-pencil questionnaire followed by video-game, questionnaire, Type A interview, complexity interview, and biographic questions, with rest periods appropriately interspersed).

Measurement

Measurements of systolic blood pressure, diastolic blood pressure and heart rate were taken throughout the sequence of tasks at two-minute intervals (except when subjects were working on questionnaires). Measurements for the

rest period between the biographical and the complexity interview (here called social baseline), for the Complexity Interview, the Type A interview, and the four (non-practice) playing periods of the game were employed as the units of analysis for this research. Measurements during these task conditions were limited to four readings with two-minute intervals to limit the compression of subjects' arms. Measurements for each of the task conditions were averaged to obtain single scores and those were compared with non-social baseline values (obtained while subjects were watching the kaleidoscopic pictures* on the TV screen). Discrepancies between the four task levels and the resting levels were expressed as mean delta values.

2. Collection of TMI Data

In the period between week 2 and week 6 following the TMI accident, patients presenting at the clinic of the Department of Family and Community Medicine at the Hershey Medical Center responded to a five point attitude scale designed to assess the degree to which they were upset about the TMI events. Subjects circled one of the following options: extremely upset (socred 1), quite upset (scored 2), somewhat upset (scored 3), a little upset (scored 4) or not upset (scored 5).

In addition, data on the length of time during which a subject had been a patient at the Medical Center was obtained. The number of clinic visits during that time period was divided by the number of months a person had been a patient to obtain an average physician utilization score. The higher the score, the more visists to a physician per unit time had been made. For example, a score in excess of 1.0 would suggest that the person visited a physician, on the average, more than once a month.

---

*Non-social baseline levels were also obtained at the end of the experimental sessions and for the resting periods between the game periods. Data analysis indicated no difference in systolic and diastolic blood pressure or heart rate for these various non-social baseline conditions.

Finally, data on the number of visits to the clinic (or other facility) at the Medical Center during the year following the TMI accident was obtained. Again, the number of visits was divided by 12 to obtain utilizations per month. To calculate a score representing excess utilization of medical services after TMI, the value of utilization per month following TMI was subtracted from utilizations in other years. Excess visits to a physician in the year following TMI are consequently represented by scores below zero, less than average utilization by scores above zero.

RESULTS AND DISCUSSION

The obtained data were primarily analyzed with correlational methods. Specific tests of significance between groups differing in their attitudinal responses to the TMI events were employed to validate obtained correlational effects. Tests of significance compared persons scoring four or five on the scale measuring subjects' degree of upset during the TMI accident period (not very upset) with persons scoring between one and three on that scale (very or moderately upset). Each group contained sixteen subjects.

Correlational procedures were utilized to describe general relationships among physiological strain measures in the laboratory, responses to scales following each task period and TMI-related measures. The data are presented in Table 1.

It should be recalled that Streufert et al. (1982) observed that stressors originating in social settings tended to affect both systolic and diastolic blood pressure changes to the same degree. Task (action) oriented stressors, on the other hand, appeared to primarily produce elevations in diastolic blood pressure. If TMI stress was primarily social in origin, i.e., if it had been generated by interaction with others, then persons who are more likely to be

Table 1

Correlations between delta blood pressure and heart rate under four stressor conditions and TMI related stress measures.

Measure	Condition	TMI Attitude low score = more upset about TMI accident	Visits to physician per unit time (high score = more visits	Excess visits to physician in year following TMI (low score = more visits than in other years)
Systolic Elevation above Baseline (Δ) (High score = greater elevation)	Social Baseline	-.02	.50	-.14
	Complexity Interview	0	-.04	-.14
	Type A Interview	-.04	.03	-.17
	Visual-Motor Task	.06	.20	-.15
Diastolic Elevation above Baseline (High score = greater elevation	Social Baseline	-.10	-.39**	-.29**
	Complexity Interview	.06	-.43***	.01
	Type A Interview	-.09	-.33**	-.12
	Visual-Motor Task	-.26*	-.36**	-.07
Heart Rate Elevation above Baseline (High score = greater elevation)	Social Baseline	-.15	-.14	.08
	Complexity Interview	-.20	-.20	.18
	Type A Interview	-.27*	-.17	.13
	Visual-Motor Task	-.08	-.11	.16

* $p < .10$

** $p < .05$

*** $p < .01$

socially stressed should have responded. If, on the other hand, TMI stress was more task/action oriented e.g., resulted in concerns with what action to take as a consequence of the accident, persons who are more likely to be task stressed should have responded. These differences might well be expected to be reflected in the laboratory, if parallel effects of life stress and lab stress are observed. Reports from various authors would suggest that TMI produced primarily task stress (e.g., questions as to whether one should or should not leave the area). Persons responding with task stress during TMI, as would likely be reflected on the measures obtained by Houts and associates, could then be expected to respond less to social laboratory conditions, and more to the task related stressor in the lab. It should be noted again that these effects cannot, however, be expected to be very large: the different stressor modalities and the time lapse between the TMI events and the time of participation in the present research (several years) should diminish any similarities.

The data show that the attitude measure concerned with subjects' upset during the TMI experience relates specifically to increases in diastolic arousal in the laboratory task condition ($r = .26$) and to elevations in heart rate during the threatening Type A interview ($r = .27$). Since both of these correlations are only marginally significant ($p < .10$), t tests were employed to compare subjects with high scores (not very upset) to subjects with low scores (more upset). The significance tests did confirm the relationship between the TMI attitude scale and diastolic elevation in the (non-social) task ($t = 2.204$, $p = .03$), but did not confirm the relationship of attitude to delta heart rate.

As stated earlier, the average number of visits a person makes per unit time may be considered as one attempt to increase perceptions of control over

one's own life (c.f., the work of Cohen, 1980; Davidson et al., 1982; Glass and Singer, 1972; Mills and Krantz, 1979; Sherrod, 1974) to avoid learned helplessness (Seligman, 1975). Persons seeking medical help in response to symptoms are likely persons who act upon impinging stressor events. They may be persons who would procrastinate less and would likely not fail to respond entirely in the face of such events. If a larger number of visits to a physician is an expression of seeking control, then one would expect less arousal (particularly diastolic, as suggested by the data above) in response to the laboratory stressor events. However, this lesser arousal should not hold for persons who engaged in excess visits during the year immediately following the TMI accident. Excess visits should relate to more symptom reporting* following TMI, as suggested by a number of writers (see above), indicating higher levels of experienced stress.

The obtained data (Table 2) corroborate the predicitons for both groups of persons. Diastolic blood pressure was less elevated in the laboratory for persons who were more frequent users of physician's services (significant negative correlations). The relationship between the excess visit variable and diastolic blood pressure, however, is not significant or shows a significant relationship in the opposite direction ($r = -.29$, $p < .05$ for the non-social to social base-line comparison). In other words, people who made excess visits to physicians during the year following the TMI accident produced higher delta arousal levels on at least one of the diastolic measures.

---

*While it is likely that persons who visit physicians with greater frequency appear with perceived symptoms that are physiologically or psychologically meaningful, those who made excess visits to their physicains in the year after TMI likely generated a number of imagined symptoms supposedly related to the TMI accident. Requesting aid for these symptoms would less likely imply an attempt to increase control and more likely suggest psychologically-based stress reactions which mimic symptoms that might be expected by the person following radiation leaks or other undesirable effects of the TMI accident.

Correlations between the TMI measures and scale responses obtained at the end of each task period in the visual motor task (task difficulty, satisfaction and enjoyment) are presented in Table 2. The data show that persons who were upset about TMI tended to find the task more difficult and expected others to find the task similarly difficult. A t-test analysis comparing high and low scorers supports this conclusion: t values of 2.71 ($p = .035$) and 2.087 ($p = .043$) respectively, were obtained. This finding is not unexpected: Davidson et al (1982) have reported that persons who were particularly stressed by TMI continue to experience greater difficulty in task performance and in task endurance, even at the present time, suggesting the possibility of some continuing stressor effects on the population living near the TMI plant. The fact that such persons experienced the laboratory task as more difficult, as well, corresponds to the Davidson et al data and corroborates the stress relatonships that have been obtained between lab and life in this anlaysis.

No relationship between visits to physicians per unit time and the attitude scales (degree of upset) were found. If, as suggested, visits to physicians are related to control, no such effects should have been expected. However, persons who made excess visits to physicians during the year following TMI (i.e., persons who likely did experience considerable stress) expressed less satisfaction with their performance in the laboratory ($r = .35$, $p < .05$). As suggested by other research, dissatisfaction is not at all an unusual characteristic of those persons who were particularly upset by the TMI events.

While the obtained relationships between responses to the TMI accident and measures of physiological strain in the laboratory are not very large, they are, nonetheless, quite encouraging, particularly if one considers the

Table 2

Correlations between scale responses following participation in each period of the visual-motor task with TMI related stress measures.

Measure	TMI Attitude (low score = more upset)	Visits to physician per unit time (high score = more upset)	Excess visits to physician in year following TMI (low score = more visits than in other years)
Perceived task difficulty for self	-.34**	-.01	-.07
Estimated task difficulty for others	-.35**	-.10	.02
Satisfaction with own performance	.06	-.08	.35**
Enjoyment of the task	.18	-.12	.13

** $p < .05$

years that have elapsed since the TMI accident and the considerably different modalities of the compared stressor events. The parallel effects of stressors in lab and life appear to be particularly and reliably focused on diastolic blood pressure elevations and appear to be most relevant to the (non-social) task condition. It has been argued that diastolic elevation is associated with norepinephrine showers and peripheral constriction, preparing the organism for a "fight or flight" responses. It is likely that such a response was associated with the TMI events as well. One may then conclude with some certainty that stress induction, as practiced in the laboratory procedures employed in this research program, does represent the desired external validity level.

REFERENCES

Aronson, E. and Carlsmith, J.M. Experimentation in social psychology in G. Lindzey and E. Aronson (Eds.): The handbook of social psychology, Vol. 2. Reading Mass: Addison-Wesley Publishing Co., 1968.

Baum, A., Gatchel, R.J., and Schaeffer, M.A. Emotional, behavioral, and physiological effects of chronic stress at Three Mile Island. Unpublished manuscript, 1981.

Bromet, E. Three Mile Island: Mental health findings. Pittsburgh: Western Psychiatric Institute and Clinic and the University of Pittsburgh, 1980.

Cohen, S. Aftereffects of stress on human performance and social behavior: A review of research and theory. Psychological Bulletin, 1980, 88, 82-108.

Collins, D.L., Baum, A., and Singer, J.E. Coping with chronic stress and Three Mile Island: Psychological and biochemical evidence. Unpublished manuscript, 1981.

Davidson, L.M., Baum, A., and Collins, D.L. Stress and control related problems at Three Mile Island. Journal of Applied Social Psychology, 1982, 12, in press.

Dohrenwend, B.P., Dohrenwend, B.S., Kasl, S.V., and Warheit, G.J. Report of the Task Group on Behavioral Effects to the President's Commission on the Accident at Three Mile Island. Washington, D.C., October, 1979.

Fleming, R., Baum, A., Gisriel, M.M., and Gatchel, R.J. Mediation of stress at Three Mile Island by social support. Unpublished manuscript, 1981.

Flynn, C.B. Three Mile Island telephone survey. U.S. Nuclear Regulatory Commission (NUREG/CR-1093), 1979.

Fromkin, H.L. and Streufert, S. Laboratory experimentation. In M. Dunette (Ed.): Handbook of industrial and organizational psychology. Chicago: Rand McNally, 1976.

Glass, D.C. and Singer, J.E. Urban stress: Experiments on noise and social stressors. New York: Academic, 1972.

Henderson, R.A., Houts, P.S., and Miller, R.W. Family practice use and response to Three Mile Island crisis. In M. Lipkin, Jr., J. Boufford, J. Froom and K.L. White (Eds.): Primary care research in 1981. New York: The Rockefeller Foundation, 1982.

Houts, P.S. and Goldhaber, M.K. Psychological and social effects on the population surrounding Three Mile Island after the nuclear accident on March 28, 1979. In S. Majumdar (Ed.): Energy, the environment and the economy. Pennsylvania Academy of Sciences, 1981.

Houts, P., Miller, R.W., Ham, K.S., and Tokuhata, G.K. Health-related behavioral impact of the Three Mile Island nuclear accident. Report submitted to the TMI Advisory Panel on health-related studies of the Pennsylvania Department of Health, Hershey, PA, April, 1980.

Krahenbuhl, G.S. Pilot stress in A-10 surface-attack training. US AFHRL Technical Report No. 80-16, 1980.

Mills, R.T. and Krantz, D.S. Information, choice and reactions to stress: A field experiment in a blood bank with laboratory analogue. Journal of Personality and Social Psychology, 1979, 37, 608-620.

Nogami, G.Y. Good-fast-cheap: Pick any two: Dilemmas about the value of applicable research. Journal of Applied Social Psychology, 1982, 12, in press.

Rosenman, R.H. The interview method of assessment of the coronary-prone behavior pattern. In T.M. Dembroski, S.M. Weiss, and J.L. Shields (Eds.): Coronary-prone behavior. New York: Springer, 1978.

Seligman, M.E.P. Helplessness: On depression, development and health. San Francisco: W.H. Freeman, 1975.

Sherrod, D.R. Crowding, perceived control and behavioral aftereffects. Journal of Applied Social Psychology, 1974, 4, 171-186.

Schroder, H.M., Driver, M.J., and Streufert, S. Human information processing. New York: Holt, Rinehart and Winston, 1976.

Schroder, H.M. and Streufert, S. The measurement of four systems of personality structure varying in level of abstractness: Sentence completion method. Princeton University: ONR Technical Report #11, 1963.

Streufert, S., Streufert, S.C., Lewis J., Henderson, R., and Shields, J.L. Differential effects of four stressors on blood pressure and heart rate. Pennsylvania State University College of Medicine: Technical Report ONR No. 5.

Streufert, S. and Suedfeld, P. A decade of applied social psychology: An editorial. Journal of Applied Social Psychology, 1982, 12, in press.

Wortman, C.B. Transition from the laboratory to the field: Problems and progress. Applied Social Psychology Annual, 1980, 1, 197-233.